

## ELASTIC HEADWEAR

### BACKGROUND OF THE INVENTION

#### (a) Field of the Invention

[0001] The present invention relates to elastic headwear, and more particularly to ventilated elastic headwear using a warp knitted mesh.

#### (b) Description of the Related Art

[0002] Conventional elastic headwear such as a cap and a hat includes an elastic crown portion and a stretchable sweatband. This design is described in U.S. Pat. No. 5,715,540. The elastic crown portion is made of a solid material which may cause the head to become overheated in warm weather because it is not well ventilated.

[0003] Attempts to enhance ventilation have been made, such as U.S. Pat. No. 6,067,658. This design has a crown composed of double-knit weft knitted fabrics. The double-knit weft knitted fabrics may enhance the ventilation of the cap, but they are so soft that it is difficult for the cap to retain its shape during carriage or display for sale.

[0004] In addition, mesh-type warp knitted fabric has been used as a crown portion in order to enhance the ventilation, as well as for shape retention of the headwear. The mesh-type warp knitted fabric is processed by stretching it on a tenter frame, heating it to provide stiffness, and stabilizing it. However, this results in a lack of elasticity of the cap.

### SUMMARY OF THE INVENTION

[0005] In view of the prior art described above, it is an object of the present invention to provide elastic headwear having a stretchable warp knitted mesh which has enhanced ventilation as well as shape-retention.

[0006] To achieve this and other objects, as embodied and broadly described herein, elastic headwear includes a head-covering portion being stretchable in at least a circumferential direction thereof, and a sweatband being stretchable in at least a circumferential direction thereof. The head-covering portion has a plurality of pieces, and at least one piece is made of a stretchable warp knitted mesh which has at least one non-covered stretch yarn and a plurality of non-stretch yarns. The non-covered stretch yarn and the plurality of non-stretch yarns are provided in rows without being twisted with each other. The non-covered stretch yarn is

hereinafter referred to as a stretch yarn which is not covered by any covering yarn, by contrast with a conventional covered stretch yarn such as spandex covered yarn.

**[0007]** The non-covered stretch yarn is preferably selected from a non-covered spandex yarn and a textured yarn.

**[0008]** The stretchable warp knitted mesh of the crown portion is preferably aligned such that the course direction of the mesh is substantially identical with the circumferential direction.

**[0009]** Both the foregoing general description and the following Detailed Description are exemplary and are intended to provide further explanation of the invention as claimed.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

**[0010]** The accompanying drawings provide further understanding of the invention, and together with the Detailed Description, explain the principles of the invention. In the drawings:

**[0011]** Fig. 1 is a perspective view of a first embodiment of a cap according to the present invention;

**[0012]** Fig. 2 is a bottom view of the cap of Fig. 1;

**[0013]** Fig. 3 is a schematic diagram of stretchable warp knitted mesh;

**[0014]** Fig. 4 is a photograph showing the stretchable warp knitted mesh;

**[0015]** Fig. 5 is a perspective view of a second embodiment of a cap according to the present invention; and

**[0016]** Fig. 6 is a bottom view of the cap of Fig. 5.

#### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

**[0017]** Preferred embodiments of the present invention will hereinafter be described in detail with reference to the accompanying drawings.

**[0018]** Referring to Figs. 1 and 2, a cap 10 has a crown portion 100 for being worn on a head of a wearer, a visor portion 200 coupled to the crown portion 100 for blocking sunlight, and a stretchable sweatband 300 provided at the interior circumference of the crown portion 100.

The present invention is not limited to the cap as shown in Figs. 1 and 2, which merely shows an example as a kind of application, and it may be a hat or other various kinds of headwear.

**[0019]** The crown portion 100 is made up of a plurality of pieces such as front pieces 110, 120, side pieces 130, 160, and rear pieces 140, 150, which form a hemispherical shape of the crown portion. The front pieces 110, 120 may be stiffened using materials known in the art to enhance the appearance of the cap 10.

**[0020]** The other pieces 130-160 are made of stretchable warp knitted mesh for enhanced ventilation and shape retention. The stretchable warp knitted mesh may be manufactured with general warp knitting machines such as Tricot, Raschel, and Milanese knitting machines. Fig. 3 shows an example of the stretchable warp knitted mesh. The mesh is composed of three threads M1, M2, M3, and it is produced using six needles. The threads M1, M2 are non-stretch threads, and they are made up of a plurality of non-stretch yarns which are synthetic yarns selected from Nylon, Polyester, Polyethylene Terephthalate (PET), Polyethylene (PE), and Polypropylene (PP). The thread M3 is stretchable, and it is made up of at least one non-covered stretch yarn Y1 and a plurality of non-stretch yarns Y2. The non-covered yarn Y1 and the plurality of non-stretch yarns Y2 are provided in rows without being twisted with each other, as shown in the enlarged view of Fig. 3. For example, the non-covered yarns Y1 are two, while the non-stretch yarns Y2 are thirty in one thread M3 of Fig. 3.

**[0021]** The non-covered stretch yarn Y1 may be a spandex yarn which is not covered by any covering yarn as is in the conventional spandex covered yarn. The non-covered stretch yarn Y1 may be a textured yarn. The textured yarns are those which have been mechanically or chemically treated to impart kinks, curls, or crimps to the individual filaments to enhance latent contraction thereof.

**[0022]** The non-stretch yarns Y2 are synthetic yarns selected from Nylon, Polyester, Polyethylene Terephthalate (PET), Polyethylene (PE), and Polypropylene (PP), similar to the threads M1, M2.

**[0023]** Because the non-covered stretch yarn Y1 is disposed with the non-stretch yarns Y2 without twisting, the thread M3 has a grain which looks as if many lines of the synthetic yarns are disposed in their lengthwise direction. In contrast, conventional stretchable thread is produced with a spandex yarn at its core and non-stretch yarns twisted around the core to cover the spandex yarn, so its grain looks different than the thread M3.

**[0024]** The mesh is stretchable in a course direction as well as a wale direction, since the stretch threads M3 resides in both directions. The mesh is preferably aligned such that the course direction thereof is substantially identical with the circumferential direction of the crown portion 100. In this case, the thread M3 is disposed to show vertical lines on the crown portion 100 as shown in Fig. 4, facilitating the crown portion 100 to stand somewhat erect for appearance purposes. The vertical lines of thread M3 are also aesthetically pleasing since the yarns Y1, Y2 are not twisted, but are displaced together in rows to prominently show the vertical grain of the thread M3 while the crown portion 100 is provided with stretchability.

**[0025]** When a wearer wears the cap 10 of Figs. 1-2, the cap stretches in the circumferential direction to enhance wearing comfort due to rapid sweat evaporation and ventilation through the pieces 130-160 of the crown portion 100.

**[0026]** Referring now to Figs. 5-6, a second embodiment of the present invention will be described. A cap 20 is similar to the cap 10 of Figs. 1-2, except that the cap 20 has a size adjustment member 400 in order to further adjust the size thereof. The cap 20 has a crown portion 100 for being worn on a head of a wearer, a visor portion 200 coupled to the crown portion 100 for blocking sunlight, and a stretchable sweatband 300 provided at the interior circumference of the crown portion 100. The size adjustment member 400 may be a pair of plastic straps as shown in Figs. 5-6. The cap 20 which utilizes this size adjustment member 400 has a semicircular open area forming a gap at the rear pieces 140, 150 of the crown portion 100, and the straps are attached at opposite ends of the open area. The first strap has a plurality of holes, and the second strap has a plurality of protrusions designed to engage the holes of the first strap. The cap 20 with the size adjustment member 400 typically accommodates a larger range of cap sizes than the cap 10 of the first embodiment of the present invention.

**[0027]** Another type of size adjustment member may be a pair of straps utilizing what is referred to as Velcro hook and loop fastener means. The overall structure and appearance of a cap which utilizes this means is similar to the above. A first strap having a Velcro loop fastener patch is attached to one end of the open area, and a second strap having a corresponding Velcro hook fastener patch is attached to the opposite end of the open area.

**[0028]** Yet another type of size adjustment member may include a continuously adjustable belt with a buckle assembly.

**[0029]** The crown portion 100 is made up of a plurality of pieces such as front pieces 110, 120, side pieces 130, 160, and rear pieces 140, 150 which form a hemispherical shape of the crown portion. The front pieces 110, 120 may be stiffened using materials known in the art to enhance the appearance of the cap 10.

**[0030]** The other pieces 130-160 are made of stretchable warp knitted mesh for enhanced ventilation and shape-retaining properties. The stretchable warp knitted mesh may be manufactured by general warp knitting machines such as Tricot, Raschel, and Milanese knitting machines, the same as in the description referring to Figs. 3-4. At least one of the threads of which the mesh is made up is stretchable and is composed of at least one non-covered stretch yarn and a plurality of non-stretch yarns. The non-covered stretch yarn and the plurality of non-stretch yarns are provided in rows without being twisted with each other, as shown in the enlarged view of Fig. 3.

**[0031]** When a wearer wears the cap 20 as shown in Figs. 5-6, the cap stretches in the circumferential direction to enhance wearing comfort due to rapid sweat evaporation and ventilation through the pieces 130-160 of the crown portion 100. The wearer can adjust the size of the cap 20 by adjusting the size adjusting member 400.

**[0032]** Although the front pieces of the crown portion are stiffened in the first and second embodiments, it should be noted that all pieces or a part of the crown portion can be made of the warp knitted mesh according to the specific design.

**[0033]** It will be apparent to those skilled in the art that various modifications and variations can be made to the present invention without departing from the spirit and scope of the invention.